# 9th Class 2017

| Math (Science) | Group-II | Paper-I |
|---|---|---|
| Time: 2.10 Hours | (Subjective Type) | Max. Marks: 60 |

## (Part-I)

**2. Write short answers to any Six (6) questions: 12**

**(i) Define the scalar matrix.**

**Ans** A diagonal matrix is called a scalar matrix, if all the diagonal entries are same and non-zero.

**(ii) Find the product:** $[-3 \quad 0]\begin{bmatrix}4\\0\end{bmatrix}$

**Ans** $[-3 \quad 0]\begin{bmatrix}4\\0\end{bmatrix} = [-3(4) + 0(0)]$

$= [-12 + 0]$

$= [-12]$

**(iii) Simplify:** $\sqrt[5]{\frac{3}{32}}$

**Ans** $\sqrt[5]{\frac{3}{32}} = \frac{\sqrt[5]{3}}{\sqrt[5]{32}}$

$= \frac{(3)^{1/5}}{(32)^{1/5}} = \frac{3^{1/5}}{2^{5 \times 1/5}}$

$= \frac{3^{1/5}}{2}$

**(iv) Find the value of :** $i^{12}$

**Ans** $i^{12} = (i^2)^6$

$= (-1)^6$

$= 1$

**(v) Find the value of x:** $\log_x 64 = 2$

**Ans** Given, $\log_x 64 = 2$

In exponential form,

$x^2 = 64$

$x^2 = 8^2$

$x = 8$

(vi) Express in scientific notation: 0.00074

Ans $0.00074 = \frac{74}{100000} = \frac{7.4}{10000}$

$= \frac{7.4 \times 10}{10^5} = \frac{7.4}{10^{5-1}}$

$= \frac{7.4}{10^4}$

$= 7.4 \times 10^{-4}$

(vii) Reduce the rational expression to the lowes form:

$$\frac{120x^2y^3z^5}{30x^3yz^2}$$

Ans $\frac{120x^2y^3y^5}{30x^3yz^2} = 4x^{2-3}\, y^{3-1}\, y^{5-2}$

$= 4x^{-1}\, y^2z^3$

$= \frac{4y^2z^3}{x}$

(viii) Simplify: $\frac{\sqrt{21}\sqrt{9}}{\sqrt{63}}$

Ans $\frac{\sqrt{21}\sqrt{9}}{\sqrt{63}} = \sqrt{\frac{21 \times 9}{63}}$

$= \sqrt{\frac{3 \times 7 \times 3 \times 3}{3 \times 3 \times 7}}$

$= \sqrt{3}$

(ix) Factorize: $3x^2 - 75y^2$

Ans $3x^2 - 75y^2 = 3(x^2 - 25y^2)$

$= 3\{(x)^2 - (5y)^2\}$

$= 3(x + 5y)(x - 5y)$

3. Write short answers to any Six (6) questions: 12

(i) Find H.C.F of: $39x^7y^3z$, $91x^5y^6z^7$

Ans

Factors of $39x^7y^3z = 3 \times 13 \,.\, x \,.\, x \,.\, x \,.\, x \,.\, x \,.\, x \,.\, x \,.\, y \,.\, y \,.\, y \,.\, z$

Factors of $91x^5y^6z^7 = 7 \times 13 \,.\, x \,.\, x \,.\, x \,.\, x \,.\, x \,.\, y \,.\, y \,.\, y \,.\, y \,.\, y$

$y \,.\, z \,.\, z \,.\, z \,.\, z \,.\, z \,.\, z \,.\, z$

Common Factors = 13, x, x, x, x, x, y, y, y, z

H.C.F = $13x^5y^3z$

(ii) **Solve the equation:** $\sqrt{x-3}-7=0$

Ans

$$\sqrt{x-3}-7=0$$
$$\sqrt{x-3}=7$$
$$(\sqrt{x-3})^2=(7)^2$$
$$x-3=49$$
$$x=52$$

(iii) **Solve for x:** $\frac{1}{2}|3x+2|-4=11$

Ans

$$\frac{1}{2}|3x+2|-4=11$$
$$\frac{1}{2}|3x+2|=11+4$$
$$\frac{1}{2}|3x+2|=15$$
$$|3x+2|=30$$

$3x+2=30$ ; $3x+2=-30$

$3x=30-2$ ; $3x=-30-2$

$3x=28$ ; $3x=-32$

$x=\frac{28}{3}$ ; $x=\frac{-32}{3}$

(iv) **Define the ordered pair.**

Ans An ordered pair of real numbers x and y is a pair (x, y) in which elements are written in specific order, *i.e.*, (x, y) is an ordered pair in which first element is x and second element is y, such that $(x, y) \neq (y, x)$.

(v) **Find the value of m and c of $2x - y = 7$ by expressing it in the form $y = mx + c$.**

Ans

$$2x-y=7$$
$$2x-7=y$$
$$\Rightarrow \quad y=2x-7$$

Here, $\boxed{m=2}$ , $\boxed{c=-7}$

(vi) **Find the distance between the pair of points:**

**A (–8, 1), B (6, 1)**

**Ans** Given, A (–8, 1), B (6, 1)

$$d = |\overline{AB}| = \sqrt{(6+8)^2 + (1-1)^2}$$
$$= \sqrt{(14)^2 + (0)^2}$$
$$= \sqrt{14^2}$$
$$= 14$$

**(vii) Find the mid-point of the line segment joining each of the following pair of points:**

**A (2, –6), B (3, –6)**

**Ans** A(2, –6), B(3, –6)

$$M = \left(\frac{2+3}{2}, \frac{-6-6}{2}\right)$$
$$= \left(\frac{5}{2}, -6\right)$$

**(viii) State A.S.A postulate.**

**Ans** In any correspondence of two triangles, if two angles and their included side of one triangle are congruent to the corresponding two angles and their included side of the other triangle then the triangles are congruent.

**(ix) Define parallelogram.**

**Ans** A figure formed by four non-collinear points in the plane is called a parallelogram, if:

1. its opposite sides are of equal measure;
2. opposite sides are parallel;
3. measure of none of the angles is 90°.

**4. Write short answers to any Six (6) questions: 12**

**(i) Define bisector of an angle.**

**Ans** Angle bisector is the ray which divides an angle into two equal parts.

**(ii) If 3 cm, 4 cm and 7 cm are not the lengths of a triangle, give the reason?**

**Ans** $\because \quad 3 + 4 \not> 7$

$\therefore$ 3, 4, 7 are not the lengths of a triangle, because the sum of the lengths of any two sides of a triangle is greater than the length of the third side.

iii) **Define congruent triangles.**

Ans Two triangles are said to be congruent, if there exists a correspondence between them such that all the corresponding sides and angles are congruent.

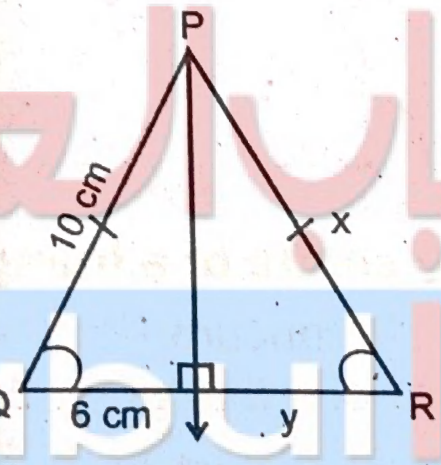
iv) **Verify that $a^2 + b^2$, $a^2 - b^2$ and $2ab$ are the measures of sides of a right angled triangle where a and b are any two real numbers ($a > b$).**

Ans As

$$(a^2 + b^2)^2 = (a^2 - b^2)^2 + (2ab)^2$$
$$a^4 + b^4 + 2a^2b^2 = a^4 + b^4 - 2a^2b^2 + 4a^2b^2$$
$$= a^4 + b^4 + 2a^2b^2$$

$\therefore$ $a^2 + b^2$, $a^2 - b^2$ and $2ab$ are the sides of a right angle.

v) **$\Delta PQR$ is an isosceles triangle, find the value of x and y:**





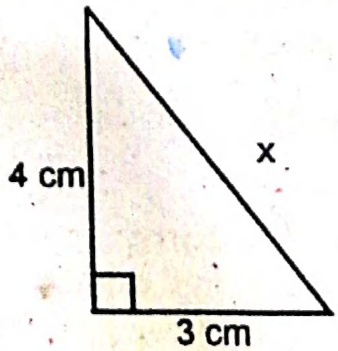

Ans As $\Delta PQR$ is an isosceles triangle, $\therefore$ $\overline{PQ} = \overline{QR}$

*i.e.*, $x = 10$ cm

Also perpendicular form P on QR bisects QR

$\therefore$ $y = 6$ cm

vi) **Find the unknown value in the given figure:**




Ans As, $(Hyp)^2 = (Base)^2 + (Alt)^2$

$(x)^2 = (3)^2 + (4)^2$

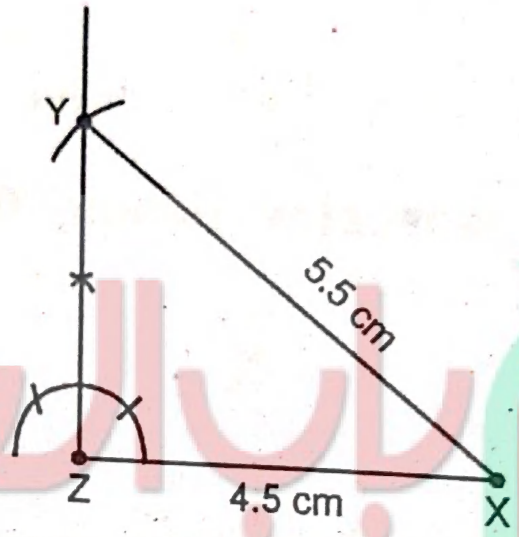
$$x^2 = 9 + 16$$
$$x^2 = 25$$
$$\sqrt{x^2} = \sqrt{25}$$
$$x = 5 \text{ cm}$$

**(vii) Define area of a figure.**

**Ans** The region enclosed by the boundary lines of closed figure is called area of a figure.

**(viii) Construct $\Delta XYZ$, in which $m\overline{XY} = 5.5$ cm, $m\overline{ZX}$ = 4.5 cm and $m\angle Z = 90°$.**

**Ans**




**(ix) Define circumcentre of a triangle.**

**Ans** The point of concurrency of the perpendicular bisectors of the sides of a triangle is called circumcentre.

## (Part-II)

**NOTE: Attempt THREE (3) questions in all. But question No. 9 is Compulsory.**

**Q.5.(a) Solve by using Cramer's rule:** (4)

$$4x + 2y = 8$$
$$3x - y = -1$$

**Ans**

$$4x + 2y = 8$$
$$3x - y = -1$$

By converting in matrix form:

$$\begin{bmatrix} 4 & 2 \\ 3 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ -1 \end{bmatrix}$$

$$AX = B$$

$$A = \begin{bmatrix} 4 & 2 \\ 3 & -1 \end{bmatrix}$$

$$|A| = \begin{vmatrix} 4 & 2 \\ 3 & -1 \end{vmatrix}$$

$$= 4(-1) - 3(2)$$

$$= -4 - 6$$

$$= -10 \neq 0$$

$$|A_x| = \begin{vmatrix} 8 & 2 \\ -1 & -1 \end{vmatrix}$$

$$= 8(-1) - (-1)(2)$$

$$= -8 + 2$$

$$= -6$$

$$|A_y| = \begin{vmatrix} 4 & 8 \\ 3 & -1 \end{vmatrix}$$

$$= 4(-1) - 3(8)$$

$$= -4 - 24$$

$$= -28$$

Now, for the values of x and y

$$x = \frac{|A_x|}{|A|} = \frac{-6}{-10} = \frac{3}{5}$$

$$y = \frac{|A_y|}{|A|} = \frac{-28}{-10} = \frac{14}{5}$$

**(b) Simplify:** $\sqrt[3]{\frac{a^l}{a^m}} \times \sqrt[3]{\frac{a^m}{a^n}} \times \sqrt[3]{\frac{a^n}{a^l}}$ **(4)**

**Ans** $\sqrt[3]{\frac{a^l}{a^m}} \times \sqrt[3]{\frac{a^m}{a^n}} \times \sqrt[3]{\frac{a^n}{a^l}} = \sqrt[3]{\frac{a^l}{a^m} \times \frac{a^m}{a^n} \times \frac{a^n}{a^l}}$

$$= \sqrt[3]{a^{l-m} \times a^{m-n} \times a^{n-l}}$$

$$= (a^{l-m+m-n+n-l})^{1/3}$$

$$= (a^0)^{1/3}$$

$$= (1)^{1/3}$$

$$= 1$$

**Q.6.(a) Use log tables to find the value of:** **(4)**

$$\sqrt[3]{\frac{0.7214 \times 20.37}{60.8}}$$

**Ans** Let $x = \sqrt[3]{\frac{0.7214 \times 20.37}{60.8}}$

$$\log x = \log \sqrt[3]{\frac{0.7214 \times 20.37}{60.8}}$$

$$\log x = \frac{1}{3}[\log 0.7214 + \log 20.37 - \log 60.8]$$

$$\log x = \frac{1}{3}[\bar{1}.8592 + 1.3090 - 1.7839]$$

$$= \frac{1}{3}(-0.1418 + 1.3090 - 1.7839)$$

$$= \frac{1}{3}(-0.6167)$$

$$= -0.2056$$

$$= -0.2056 + 1 - 1$$

$$\log x = \bar{1}.7944$$

$$x = \text{Antilog } \bar{1}.7944$$

$$x = 0.6229$$

**(b) Find the value of $x^3 - \frac{1}{x^3}$, if : $x - \frac{1}{x} = 7$**

**Ans**

$$x - \frac{1}{x} = 7$$

$$\left(x - \frac{1}{x}\right)^3 = (7)^3$$

$$(x)^3 - \left(\frac{1}{x}\right)^3 - 3(x)\left(\frac{1}{x}\right)\left(x - \frac{1}{x}\right) = 343$$

$$x^3 - \frac{1}{x^3} - 3(7) = 343$$

$$x^3 - \frac{1}{x^3} - 21 = 343$$

$$\boxed{x^3 - \frac{1}{x^3} = 364}$$

**Q.7.(a) Factorize: $x^3 + 48x - 12x^2 - 64$**

**Ans** Given,

$$x^3 + 48x - 12x^2 - 64$$

$= (x)^3 + 3(x)^2(-4) + 3(x)(-4)^2 + (-4)^3$

$= (x - 4)^3$

(b) **Find square root by using division method:** (4)

$$4x^2 + 12xy + 9y^2 + 16x + 24y + 16$$

Ans

$$\begin{array}{r|l} & 2x + 3y + 4 \\ \hline 2x & 4x^2 + 12xy + 9y^2 + 16x + 24y + 16 \\ & \pm 4x^2 \\ \hline 4x + 3y & 12xy + 9y^2 \\ & \pm 12xy \pm 9y^2 \\ \hline 4x + 6y + 4 & 16x + 24y + 16 \\ & \pm 16x \pm 24y \pm 16 \\ \hline & 0 \end{array}$$

Square root = $\pm(2x + 3y + 4)$

**Q.8.(a) Solve the given equation:** (4)

$$\frac{5(x-3)}{6} - x = 1 - \frac{x}{9}$$

Ans

$$\frac{5(x-3)}{6} - x = 1 - \frac{x}{9}$$

$$\frac{5(x-3) - 6x}{6} = \frac{9 - x}{9}$$

$$\frac{5x - 15 - 6x}{6} = \frac{9 - x}{9}$$

$$\frac{-x - 15}{6} = \frac{9 - x}{9}$$

By cross multiplication

$$-9x - 135 = 54 - 6x$$

$$-9x + 6x = 54 + 135$$

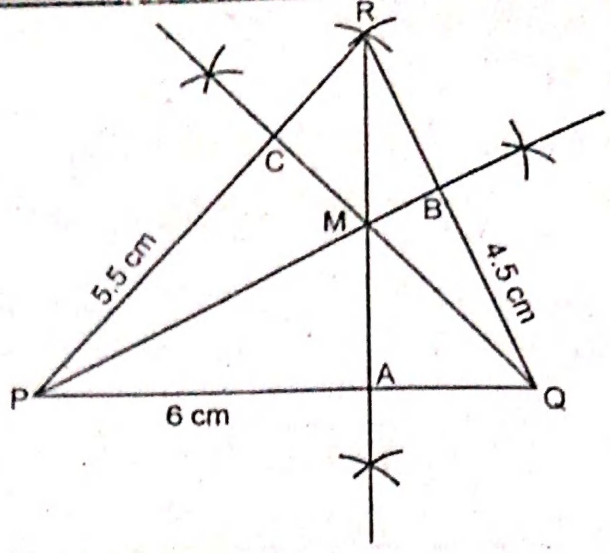
$$-3x = 189$$

$$x = \frac{189}{-3}$$

$$x = -63$$

(b) **Draw altitudes of $\Delta PQR$, when $m\overline{PQ}$ = 6 cm, $m\overline{QR}$ = 4.5 cm and $m\overline{PR}$ = 5.5 cm.** (4)

Ans



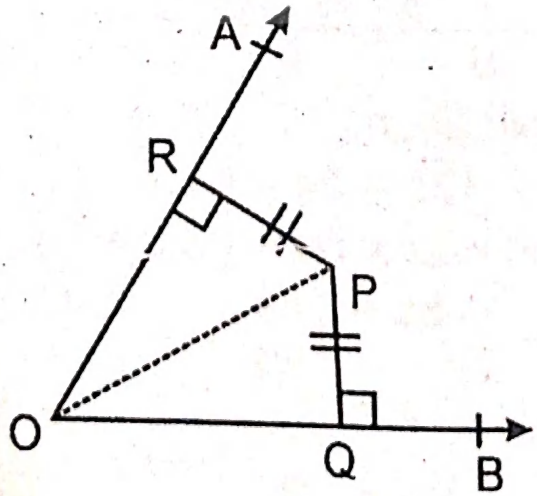

**Steps of Construction:**

1. Take $\overline{PQ}$ line as 6 cm long.
2. At point P, draw a 5.5 cm arc; and at point Q, draw 4.5 cm arc. Both of them cut each other at point R.
3. Join R with P and Q.
4. Then draw relevant altitudes of P, Q and R.
5. Thrice of these altitudes are the concurrent.

**Q.9. Prove that any point inside an angle, equidistant from its arms, is on the bisector of it.** (8)

**Ans** **Given:**

Any point P lies inside $\angle AOB$ such that $\overline{PQ} \cong \overline{PR}$ where $\overline{PQ} \perp \overline{OB}$ and $\overline{PR} \perp \overline{OA}$.




**To prove:**

Point P is on the bisector of $\angle AOB$.

**Construction:**

Join P to O.

**Proof:**

| Statements | Reasons |
|---|---|
| In $\Delta POQ \leftrightarrow \Delta POR$ | |
| $\angle PQO \cong \angle PRO$ | given (right angles) |
| $\overline{PO} \cong \overline{PO}$ | common |
| $\overline{PQ} \cong \overline{PR}$ | given |
| $\Delta POQ \cong \Delta POR$ | H.S ≅ H.S |
| $\therefore$ Hence, $\angle POQ \cong \angle POR$ | (corresponding angles of congruent triangles) |

i.e., P is on the bisector of $\angle AOB$.

**OR**

**Prove that parallelogram on equal bases and having the same (or equal) altitude are equal in area.**

**Ans** For Answer see Paper 2017 (Group-I), Q.9.(OR).